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Two new species of *Utetheisa* Hübner (Lepidoptera, Noctuidae, Arctiinae) from the Galapagos Islands, Ecuador

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Abstract

Two new species, *Utetheisa connerorum* and *Utetheisa henrii* (Lepidoptera, Noctuidae, Arctiinae) are described from the Galapagos Islands, Ecuador. The latter inhabits the highlands of San Cristobal Island while the former is widely distributed on most of the islands of the archipelago. Their habitus and genitalia are illustrated. Based on a study of the holotype, *Utetheisa galapagensis* (Wallengren) was found to be restricted to San Cristobal Island, contrary to previous reports, and is redescribed here. A key is provided to separate all six Galapagos species of *Utetheisa* based on external characters.

Keywords

Lepidoptera, Noctuidae, Arctiinae, moths, *Utetheisa*, taxonomy, species descriptions, diagnoses, key, endemicity, Galapagos archipelago

Introduction

Surveys of Lepidoptera on the Galapagos Islands during the past two decades have generated numerous records of undescribed species and new distribution records for previously reported species (e.g., Landry and Gielis 1992; Roque-Albelo and Landry 2002; Causton et al. 2006; Razowski et al. 2008).

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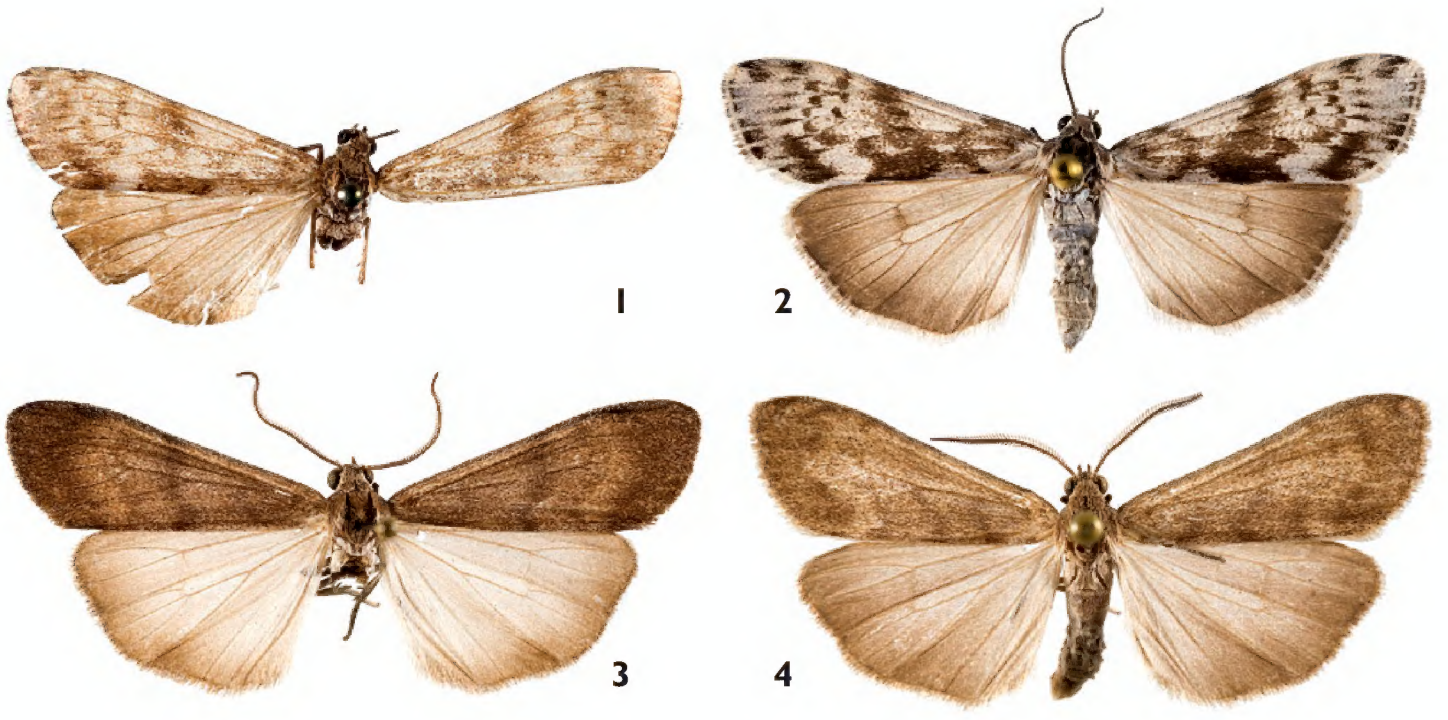
Utetheisa Hübner is the only genus of the subfamily Arctiinae occurring on the Galapagos Islands. Six species have been found on the archipelago: the widely distributed Neotropical *U. ornatrix* (L., 1758) and five endemic species, two of which are described in this paper. The original three endemic species are *U. galapagensis* (Wallengren, 1860) and *U. perryi* and *U. devriesi*, described by Hayes (1975). *Utetheisa galapagensis* has long been regarded as the widespread member of the endemic *Utetheisa* in the Galapagos. However, our study of the holotype showed that it is in fact restricted to San Cristobal Island. The widespread species is actually new and described below as *U. connerorum*.

Genus *Utetheisa* represents the third most speciose radiation of endemic Galapagos Lepidoptera following that of the Autochistidae genus *Galagete* Landry, with 12 species described (Landry 2002; Landry and Schmitz 2008) and that of the Scythrididae, yet undescribed. The Galapagos *Utetheisa* were reviewed taxonomically by Forbes (1941), Hayes (1975), and Roque-Albelo et al. (2009). Their ecology was treated by Perry and de Vries (2003), Roque-Albelo et al. (2002, 2009), and Garrett et al. (2008).

Material and methods

Field work was conducted on San Cristóbal Island by BL in 1989 and by LR-A in 2008 as part of a survey of the Galapagos lepidopteran fauna that we carried out between 1989 and 2008 on all islands of the archipelago except Darwin. Moths were collected at light (mercury vapor lamps (MVL) and ultraviolet lights (UVL)). In addition, eggs were obtained from females collected at UVL and confined to plastic cups. The females began to lay eggs during the second night of confinement. Larvae were reared to last



Figures 1–4. Habitus of Galapagos *Utetheisa* species **1** *U. galapagensis* (Wallengren), holotype female **2** *U. galapagensis*, female collected in 2008 **3** *U. henrii* sp. n., holotype **4** *U. connerorum* sp. n., holotype.

instar on *Tournefortia pubescens* Hooker *f.* (Boraginaceae) by Sarah Garrett at the insect containment facility of the Charles Darwin Research Station, Santa Cruz Island.

The specimens and genitalia preparations discussed here are deposited in the American Museum of Natural History, New York, New York (AMNH), the California Academy of Sciences, San Francisco, California (CAS), the Canadian National Collection, Ottawa, Ontario (CNC), the Invertebrates Collection of the Charles Darwin Research Station, Santa Cruz Island (IC-CDRS), and the Muséum d'histoire naturelle, Geneva, Switzerland (MHNG). The single female type specimen of *Utetheisa galapagensis* (Wallengren, 1860) was borrowed from the Naturhistoriska riksmuseet, Stockholm (NHRS). It was dissected to insure that we correctly interpreted the identity of the species.

Images of adults were taken using a Nikon® D300 equipped with a 60 mm AF Micro Nikkor® lens. Genitalia were dissected following the methodology mentioned in Landry (2006). The illustrations of the genitalia and antennae were made with the AutoMontage® system using a JVC® video camera mounted on a Leica MZ APO® stereomicroscope. Morphological terminology follows de Vos (2007).

Results

Key to the Galapagos species of *Utetheisa* based on external characters

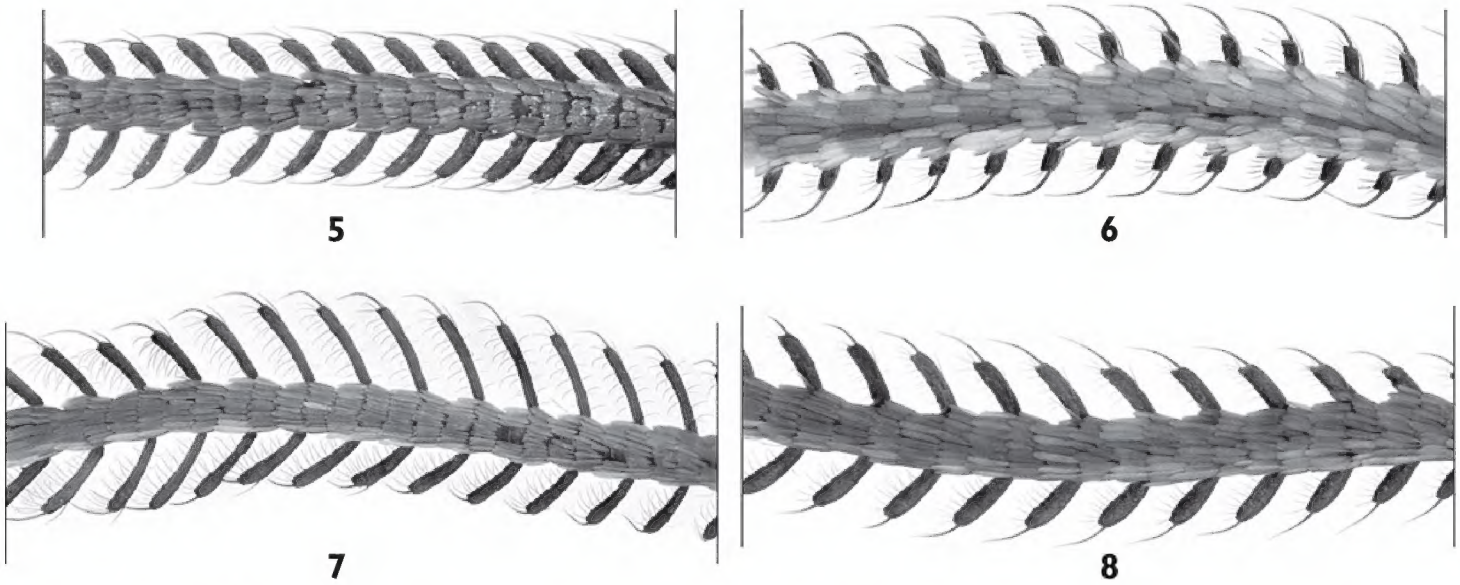
1 Forewing and thorax whitish pink with pink along forewing costa and outer margin, and black dots on thorax, on forewing costa and outer margin..... ..... ***U. ornatrix* (L.)**

– Forewing variable shades of brown, usually with some darker brown markings **2**

2 Forewing buff brown, usually with contrasting markings, at least with two dots at end of discal cell, the dorsal one sometimes obscured by conspicuous dark brown shading; hindwing with dark brown bar at end of discal cell, often with darker shading along costa and apex; male antenna strongly bipectinate ..... ***U. perryi* Hayes**

– Forewing various shades of greyish brown (Figs 1–4), rarely with two dots at end of cell; hindwing without dark brown bar at end of discal cell and without shading on costa and apex, but with shading usually along outer margin; male antenna bipectinate, with length of pectination variable **3**

3 Forewing background (Fig. 2) colour light greyish brown, with contrasting variable pattern usually with outwardly slanted subapical thick line from dorsum changing into series of spots at CuA1, rarely with two dots at end of cell, usually with postbasal, median, and postmedian lines also present and slanted toward apex from dorsal margin, forewing maximal length 15 mm; hindwing usually with darker broad band along outer margin, sometimes with faint bar at end of discal cell; male antenna with bipectination of medium length (Fig. 5) ..... ***U. galapagensis* (Wallengren)**



Figures 5–8. Male antenna Galapagos *Utetheisa* species **5** *U. galapagensis* (Wallengren) **6** *U. henrii* sp. n. **7** *U. connerorum* sp. n. **8** *U. devriesi* Hayes.

– Forewing background colour light to dark greyish brown, usually with diffuse pattern of usually complete transverse lines mostly medially and subapically, sometimes pattern absent, lines slanted towards apex or not, never with dots at end of discal cell, forewing length variable; hindwing often with darker broad band along outer margin, never with faint bar at end of discal cell; male antenna with bipectination length variable..... **4**

4 Forewing pattern (Fig. 3) dark greyish brown, with darker median and postmedian lines at right angle from dorsal margin, with darker terminal 1/5 entirely darker, forewing length 14–16 mm in males; male antenna (Fig. 6) shortly bipectinate ..... ***U. henrii* sp. n.**

– Forewing pattern light to dark greyish brown, with darker lines generally slanted towards apex from dorsal margin, with terminal 1/5 darker or not, forewing length 13.5–20.5 mm in males; male antenna bipectination of medium length or long..... **5**

5 Forewing pattern light greyish brown, with transverse lines consisting of median band thicker on dorsal margin and slightly slanted toward apex, and subapical line delimiting darker terminal 1/5, forewing length 17–20.5 mm in males; male antenna (Fig. 8) with bipectination of medium length..... ..... ***U. devriesi* Hayes**

– Forewing pattern (Fig. 4) dark greyish brown, with usually four transverse lines slanted towards apex from dorsal margin postbasally, sub- and postmedially, and subapically, pattern sometimes obscure or absent, forewing length 12–15 mm in males; male antenna (Fig. 7) strongly bipectinate .... ***U. connerorum* sp. n.**

***Utetheisa galapagensis* (Wallengren, 1860)**
Figs 1, 2, 5, 9, 12

Euchelia galapagenis [sic] Wallengren, 1860: 161. Unused original spelling.
Euchelia gallopagensis [sic] Wallengren, 1861: 370, 389. Incorrect subsequent spelling.
Utetheisa galapagensis (Wallengren); Justified emendation: Hampson, 1901: xvi, 488, pl. 50 fig. 12; Forbes, 1917: 340; Seitz, 1919–1925: 301, pl. 38; Schaus, 1923: 23; Forbes, 1941: 101, fig. 3; Linsley and Usinger, 1966: 158 (with original genus misspelled as *Euchalia*); Parkin et al., 1972: 103; Hayes, 1975: 161, figs 22, 23; Linsley, 1977: 29; Silberglied, 1978: 275; Hickin, 1979: 176; McMullen, 1993: 99; Roque-Albelo et al., 2002: 153; Perry and de Vries, 2003: 152; Garrett et al., 2008: 2–6; Roque-Albelo et al., 2009: 207 et seq.

Note on above citations. Most of these citations, except that of Wallengren (1860, 1861), and probably that of Seitz (1919–1925) given the illustration provided, actually refer to *U. connerorum*, described below.

Material examined. Holotype ♀: 1- 'Ins. | Gallop.' [printed black on white paper]; 2- '12' [printed on lavender paper]; 3- 'Euchelia | gallopagensis | Wallengr' [handwritten in faded black ink on white paper]; 4- 'BL 1655 ♀' [handwritten in black ink on green paper]. Deposited in NHRS.

Other specimens. 2 ♂, 11 ♀: 2 ♂ (dissected, slides BL 1666, LR 192), 4 ♀, 'ECU. GALAPAGOS. San Cristóbal | Sendero las tijeretas | Arid Zone 17m altitude | S 00 53′29.9 W 089 36′34.8 | 10 IV 2008 UVL | L. Roque' (IC-CDRS); 1 ♀ (dissected, slide LR 191), 'ECU. GALAPAGOS. San Cristóbal | Cerro Colorado | Arid Zone 123 m altitude | S 00 54′53.5 W 089 26′06.4 | 8 IV 2008 UVL | L. Roque' (IC-CDRS); 6 ♀ in CAS as follows: 1 ♀, 1- 'Chatham I. | GalapagosIs. | II-1-[19]06', 2- Coll. by | F. X. Williams', 3-'Utetheisa | galapagensis | Wallengren | det. A.H. Hayes 1973'; 1 ♀, same data except date (II-9-[19]06); 1 ♀ (dissected, slide BL 1665), same data except date (II-9-[19]06) and additional label 'Sappho | Cove'; 1 ♀ (dissected, slide BL 1661), same data except date (II-22-[19]06); 1 ♀, same data except date (X-14-[19]05); 1 ♀, same data except date (X-15-[19]05).

Note on type. The specimen is in rough condition (Fig. 1). The legs and antennae are all broken and the right hindwing is broken off and in a gelatin capsule on the pin. The dissected genitalia are in good condition (Fig. 12).

Diagnosis. As opposed to most of the other Galapagos *Utetheisa* species, except *U. perryi* Hayes, *U. galapagensis* usually has complex, though variable forewing markings in the form of more or less complete postbasal, median, postmedian, and subapical lines. The ground colour in this species is greyish brown, with darker brown markings whereas the ground colour of *U. perryi* is often a warmer buff brown. The male antenna of *U. galapagensis* has pectination of medium length, as in *U. devriesi*, while that of *U. perryi* has strong pectination similar to that of *U. connerorum* (Fig. 7). The male genitalia of *U. perryi* differ most markedly from those of *U. galapagensis* by the much shorter and broader cucullus (see Hayes, 1975: fig. 171). Regarding the shape of the cucullus *U. galapagensis*

mostly resembles *U. connerorum*, but the male genitalia of *U. galapagensis* differ in having less strongly developed coremata, a more swollen uncus, and the vesica has the dorsodistal narrower extension shorter, curved back only to the row of sclerotized bumps, and it has 4 small spine-like cornuti on the right side at the level of the row of sclerotized bumps whereas *U. connerorum* has 0–3 spines in the two specimens examined. The female genitalia are distinguished from those of *U. perryi* (See Roque-Albelo et al. 2009: fig. 14–2, I) by the apically wider and blunt extensions of sternum VII with a broader gap in between and a much more strongly developed section between the compressed sclerotized part of the ductus bursae and the membranous corpus bursae; they are similar to those of *U. connerorum* but differ especially by the apically rounded, longer and narrower lateral extensions, by the narrower U-shaped gap between them, with the anterior end (bottom) often slightly wider, and by the less strongly developed anterior section of the ductus bursae.

Redescription: MALE (n=2) (Figs 5, 9). Head smooth scaled, with thinner scales on lower part of frons converging medially, with ocelli, mostly greyish brown, with few scattered white scales on vertex and occiput, and white to pale beige along eye margin; frons very lightly rounded, without protuberances; eye about 3/10 width of whole head in frontal view. Labial palpus small, projected slightly forward and upward; basal segment mostly white; second segment laterally pale greyish brown with white at base and apex; apical segment darker greyish brown, with or without few paler scales apically. Antenna (Fig. 5) bipectinate; scape mostly greyish brown dorsally, white to pale beige and greyish brown ventrally; flagellum greyish brown with 1–2 beige scales laterally on basal

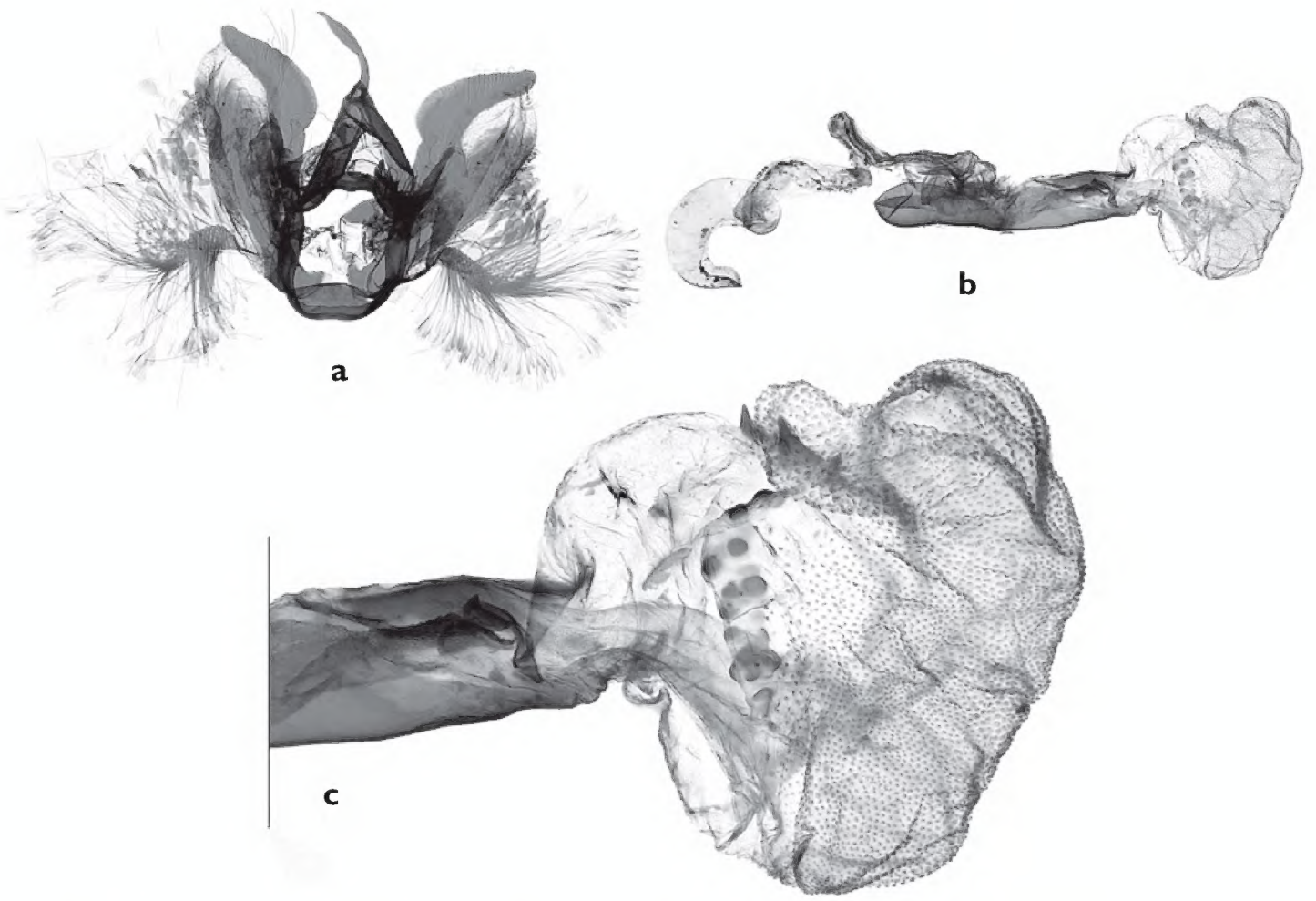


Figure 9. Male genitalia of *Utetheisa galapagensis* (Wallengren), slide LR 192 (**a**), slide BL 1666 (**b**, **c**). **a** Whole genitalia without phallus **b** Phallus **c** Enlarged vesica.

flagellomeres; some flagellomeres with one thin seta sticking out of scale cover laterally or medially (or both) and about as long as one flagellomere, flagellomeres ventrally covered with short hyaline cilia; longest pectinations slightly longer (by 1/5 of length) than width of corresponding flagellomere, each flagellomere distally adorned with thick, curved seta about 1/5 shorter than longest pectination, most pectinations except lateral ones on basal flagellomeres also adorned dorsally with shorter, curved seta.

Thorax: Patagia greyish brown with few pale beige scales laterally, with pale beige or white all around each patagia; tegulae concolorous with patagia, with more or less intense white scaling in middle and toward base, with white or pale beige thin and hair-like scales laterally and mediodistally; mesothorax mostly concolorous with tegulae, white to pale beige laterally and toward apex; metathorax white with medium-length hair-like scaling laterally and short scales in middle. Foreleg greyish brown with white ventrally on coxa and femur, and beige ventrally on tibia and tarsomeres except last. Midleg as foreleg except coxa mostly white with little pale greyish brown ventrally. Hindleg mostly white to pale beige from coxa to femur, with some pale greyish brown scaling; tarsomeres greyish brown, speckled with pale beige. Forewing length: 13–15 mm; background colour pale (almost silver) greyish brown, usually with darker greyish brown pattern of postbasal outwardly curved line often fading toward costa, thicker slanted line from middle of dorsum to shortly before middle of costa, postmedian line starting perpendicular from 2/3 dorsum then outwardly curved and becoming series of spots from CuA2 until reaching costa at 3/5, and outwardly slanted subapical thick line from dorsum changing into series of spots at CuA1 and slightly curving back toward costa; often with additional spots at base on costa, apex of discal cell, on outer margin especially in cubital sector, and on costa before apex; also some specimens mostly greyish brown between median and postmedian lines on dorsal half, and one specimen mostly greyish brown before postmedian line except along dorsum, only spotted at bases of lines, and with thicker and more complete subapical line and more prominent marginal spots; fringe with first row of scales white, second row mostly white but greyish brown at location of marginal spots; underside greyish brown with indication of upperside lines, with darker, wide outer margin band. Hindwing greyish brown, often with darker marginal band and small bar at apex of discal cell, with fringe often appearing contrastingly white, but usually greyish brown in medial sector; underside as upperside.

Abdomen: Greyish brown. Genitalia (n=2) (Fig. 9). Uncus of rather narrow girth at base, moderately long, with sparse, short setation on most of length except distally, swollen from before middle to before apex, with curved, sharply pointed, downturned apex. Cucullus with median section produced dorsally, rounded, with margin wrinkled, slightly narrowing into broadly rounded apex. Corema moderate in size, not reaching apex of cucullus, with numerous long spatulated androconial scales on narrow base, and fewer, short-stalked, bulbous ones on distal 2/3. Ampulla short, thumb-like, with mostly short setation especially at apex. Phallus straight, cylindrical, with slightly angled, short and bulbous coecum penis, with lateral walls partly unsclerotized, ventral and dorsal sclerotized areas adorned with scobination on distal 1/3 dorsally and distal end ventrally, left lateral wall distally with narrow sclerotized and scobinated band ending in short spined

crest; coecum penis without ventral incline, not enlarged, slightly bent to left; vesica with row of about 13 sclerotized rounded bumps dorsally on left side before middle, with 4 small spine-like cornuti on right side at level of row of sclerotized bumps, with dorsodistal narrower extension rather short, curved back to row of sclerotized bumps.

FEMALE (n=11) (Figs 1, 2, 12). Similar to male in most respects, but antennal flagellomeres biserrate, dorsally covered with grey-brown scales, some flagellomeres with seta sticking out dorsally, ventrally with short hyaline cilia, with thick seta at distal end of each serration about 1/4 longer than corresponding flagellomere, also with one lateral seta on each serration about half as long as distal seta. Forewing length: 12–15 mm (holotype: 14 mm). Frenulum with 2 acanthae. Genitalia (n=3) (Fig. 12). Papillae anales short, squarrish in lateral view, with apical margin straight or only slightly rounded, rather well sclerotized, with short setation along apical margin and as thick cluster at base dorsally, with long setae sparsely distributed on most of surface. Apophyses of moderate length and thickness; anteriores about 2/3 length of posteriores, latter approximately reaching edge of ostium in extension. Segment VIII narrow, sternum desclerotized medially. Apex of sternum VII forming pair of posterior extensions of medium length, apically wide and blunt, separated by broad U with lateral margins straight for most of length, enlarging only apically; ventral margin of U normally scaled; with descaled, scobinated surface on dorsal side of lateral extensions. Antrum wide, about 1/2 as wide as tergum VIII, thickly sclerotized, scobinated. Ductus bursae with posterior section dorsoventrally compressed, rather short, about as wide as antrum, thickly sclerotized, scobinated, posteriorly curved at right angle dorsally then curved at right angle anteriorly; anterior section enlarged laterally and dorsoventrally, less thickly sclerotized, slightly shorter than posterior section, with few sclerotized ridges, with spinulose zones on left and right sides. Appendix bursae dextrally curved, narrowing before connecting with ductus seminalis. Corpus bursae circular, membranous, with pattern of small hexagons, about ½ as long as ductus bursae; signa a pair of small, short-spined, limpet-shaped low internal projections.

Biology. The species was reared on *Tournefortia pubescens* Hook. *f.* (Boraginaceae) under laboratory conditions. This plant, along with the other two species of *Tournefortia* present on San Cristobal is probably the host in the field.

Distribution. Currently known only from the Galapagos island of San Cristobal; presumed to be endemic to the archipelago.

Remarks. The original spelling of the name of this species is '*galapagenis*' (Wallengren, 1860), which would appear to be a misspelling for '*galapagensis*'. The next appearance of the name, also by Wallengren (1861), was published as '*gallopagensis*' without demonstration of intentional name change, hence it is here considered an incorrect subsequent spelling. Following these, all authors have used '*galapagensis*', here considered a justified emendation and adopted as the valid name.

The species was appparently described from a unique female specimen, although the number of females is not specifically mentioned. The NHRS holds this type only.

Forbes (1941) cites *U. galapagensis* as having been reported by Hampson (1920: pl. 68), but this appears to be an error as M. Honey (pers. comm.) checked this publication and couldn't corroborate Forbes' citation.

In a preliminary analysis of 688 base pairs of the mitochondrial gene cytochrome oxidase I (COI) by Michelle DaCosta *U. galapagensis* placed as sister to *U. connerorum* collected on Santa Cruz, suggesting a close relationship between the two species. Genetic distances (corrected) between these species ranged from 1.06% to 2.26%.

Inside the corpus bursae of one dissected female (slide BL 1665) there were five spermatophores.

***Utetheisa connerorum* Roque-Albelo & B. Landry, sp. n.**
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Figs 4, 7, 11, 14

Utetheisa galapagensis (misidentifications): Schaus, 1923: 23; Forbes, 1941: 101, 106, fig. 3; Linsley and Usinger, 1966: 158 (with original genus misspelled as *Euchalia*); Parkin et al., 1972: 103; Hayes, 1975: 161, figs 22, 23; Linsley, 1977: 29; Silberglied, 1978: 275; Hickin, 1979: 176; McMullen, 1993: 99; Roque-Albelo et al., 2002: 153; Perry and de Vries, 2003: 152; Garrett et al., 2008: 2–6; Roque-Albelo et al., 2009: 207 et seq.

Material examined. Holotype ♂: 1- 'ECU[ADOR]., GALAPAGOS | Isabela, V[olcan]. Darwin | 630 m elev[ation]., 17.v.1992 | M[ercury]V[apour]L[amp], *leg.* B. Landry' [printed black on white card stock]; 2- 'HOLOTYPE | *Utetheisa* | *connerorum* | Roque-Albelo & | Landry [handwritten in black ink on red card stock]. Deposited in MHNG. Paratypes: 41 ♂, 36 ♀, from Ecuador, Galapagos Islands. Baltra: 2 ♂, 3 ♀ (one dissected, slide [AMNH] MD296), South Seymour, 23.IV.1923 (W. Beebe expedition). Fernandina: 2 ♀, Arid zone, Altitud [sic] 850 m, S 00 35453 W 091 58912, 10.II.2005 U[ltra]V[iolet]L[ight] (L. Roque, B. Landry). Floreana: 1 ♀ (dissected, slide MHNG ENTO 5770), close to Loberia, G[lobal]P[ositioning]S[ystem]: elev[ation]. 6 m, S 01° 17.102' W 090° 29.460', 11.IV.2004, uvl (P. Schmitz); 3 ♂ (one dissected, slide MHNG ENTO 5085), 9 ♀ (one dissected, slide MHNG ENTO 5086), Punta Cormoran, 21.IV.1992, M[ercury]V[apour]L[amp] (B. Landry); 1 ♂, 1 ♀, Arid zone, 130 ms[obre el]n[ivel del]m[ar], 01 17.053S/ 090 28.295W, in black light trap, 24.III.1996 (L. Roque). Genovesa: 1 ♀, Bahia Darwin, 10.III.1992, MVL (B. Landry). Isabela: 2 ♂, 1 ♀, Volcán Alcedo Top, 1.100 msnm, LS0°26'25.5" LW91°05'22", IV.1998 (L. Roque); 1 ♀, Albermarle, Tagus Cove, 6.IV.1923 (W. Beebe expedition); 2 ♂, Tagus Cove, 13.V.1992, MVL (B. Landry); 1 ♂, V[olcan]. Darwin, 300 m elev[ation]., 15.V.1992 (B. Landry); 1 ♂, 2 ♀, V[olcan]. Darwin, 300 m elev., 20.V.1992, MVL (B. Landry); 1 ♂, ± 15 km N P[uer]to Villamil, 25.V.1992, MVL (B. Landry); 1 ♀, Alcedo, Guayabillos, 900m, 30.X.2000, UVL-W[hite]L (L. Roque). Marchena: 1 ♂ (dissected, slide MHNG ENTO 5978), [no precise locality] 12.III.1992, MVL (B. Landry). Pinta: 3 ♂ (one dissected, slide MHNG ENTO 5769), Plaja Ibbeston [sic], 14.III.1992, MVL (B. Landry); 4 ♂, arid zone, 15.III.1992, MVL (B. Landry); 1 ♂, 3 ♀ (one dissected, slide MHNG ENTO 5087), 200 m elev., 16.III.1992, MVL (B. Landry); 2 ♂, 400 m elev.,

17.III.1992, MVL (B. Landry); 2 ♂ (one dissected, slide MHNG ENTO 5084), 400 m elev., 18.III.1992, MVL (B. Landry); 1 ♂, ± 50 m elev., 20.III.1992, MVL (B. Landry). San Cristobal: 1 ♂ (dissected, BL 1652), 4 km SE Pto Baquarizo [sic], 12.II.1989, MVL (B. Landry); 1 ♀ (dissected, BL 1662), 22.II.[19]06 (F. X. Williams). Santa Cruz: 1 ♂ (dissected, slide [AMNH] MD259), Indefatigable, 9.I.1936 (W. von Hagen); 1 ♀, same data except 12.I.1936; 1 ♂, 1 ♀, same data except 28.I.1936; 1 ♂, Finca Vilema, 2 km W Bella Vista, 1.IV.1992, MVL (B. Landry); 1 ♂, Los Gemelos, 27.V.1992, MVL (B. Landry); 1 ♀, Barranco, Arid zone, 20 msnm, 00 44' 34S-090 18' 21W, 13.IX.1996, in fluorescent light (L. Roque);1 ♂, same locality, 8.X.1996, in fluorescent light tramp [sic] (L. Roque); 2 ♀, Santa Cruz, 30.X.1935 (W. von Hagen); 1 ♀, same data except 7.XI.1935; 1 ♂ (dissected, slide [AMNH] MD258), 1 ♀ (dissected, slide BL 1664), same data except 25.XI.1935. Santa Fé: 2 ♂, Tourist Trail, 28.V.1992, MVL (B. Landry). Santiago: 2 ♂ (one dissected, slide MHNG ENTO 5083), Bahia Espumilla, 4.IV.1992, MVL (B. Landry); 1 ♂, 200 m elev., 5.IV.1992, MVL (B. Landry); 1 ♂, 1 ♀ (dissected, slide MHNG ENTO 5755), Aguacate, 520 m elev., 6.IV.1992, MVL (B. Landry); 1 ♂, same data but 7.IV.1992; 1 ♀, Central, 700 m elev., 9.IV.1992, MVL (B. Landry); 1 ♀, 3 km E Playa Espumilla, 200 mts, 4.IX.1998, UVL (L. Roque). Deposited in AMNH, BMNH, CAS, CNC, IC-CDRS, and MHNG.

Diagnosis. This species may or may not have a pattern of up to four more or less lightly contrasted transverse lines; in this respect it differs most notably from the usually

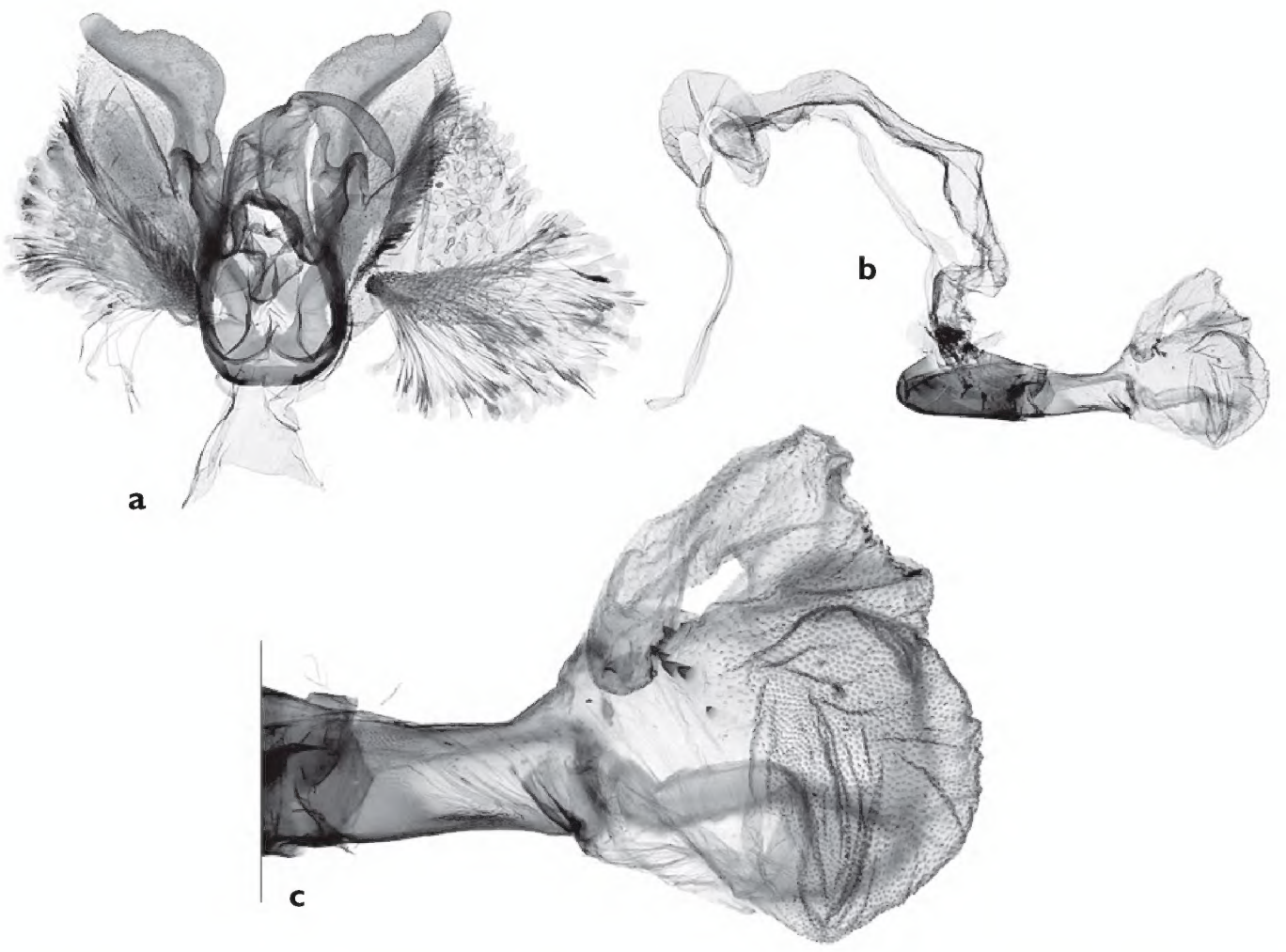


Figure 10. Male genitalia of *Utetheisa henrii* sp. n., slide BL 1654. **a** Whole genitalia without phallus **b** Phallus **c** Enlarged vesica.

more strongly marked *U. galapagensis* (Fig. 2) and *U. perryi* (see Hayes, 1975: Figs 20, 21). It differs from the larger *U. devriesi* (17–20.5 mm male forewing length) and *U. henrii* (14–16 mm male forewing length) in the submedian and postmedian lines slanted towards the apex, whereas *U. henrii* has the median and postmedian lines starting at right angle from the dorsal margin (Fig. 3), while in *U. devriesi* there is just one median line that is thickened on the dorsal margin (see Hayes, 1975: Figs 24, 25). Moreover, the male of *U. connerorum* has the most strongly pectinate antenna of the three species (Figs 6–8). In male genitalia *U. connerorum* (Fig. 11) has a moderately developed cucullus as in *U. galapagensis* (Fig. 9), but it has more strongly developed coremata than *U. galapagensis*, a less strongly swollen uncus, the vesica has the dorsodistal narrower extension longer, curved back almost to the sclerotized end of the phallus shaft, and it has 0–3 small spine-like cornuti on the right side at the level of the row of sclerotized bumps whereas *U. galapagensis* has 4 spines in the two specimens examined. In female genitalia *U. connerorum* mostly resembles *U. galapagensis* as they share a similar apex of sternum VII with a U-shaped median gap, but the posterior extensions of sternum VII in *U. connerorum* are narrower, longer, and apically rounded, whereas they are apically blunt in *U. galapagensis*.

Description. MALE (n=42) (Figs 4, 7, 11). Head smooth scaled, with thinner scales on frons converging medially, with ocelli, mostly greyish brown with some beige scales, sometimes slightly paler along eye margin and dorsal base of antenna; frons slightly rounded, without protuberances; eye about 1/4 width of whole head in frontal view. Labial palpus small, projecting slightly forward and upward, mostly white on basal segment, greyish brown mixed with beige on second, and greyish brown on third, sometimes with 1–2 white scales at apex. Antenna (Fig. 7) bipectinate; scape and pedicel mostly greyish brown; flagellum greyish brown with 1–3 pale beige scales on each flagellomere laterally, some flagellomeres with one thin seta sticking out of scale cover laterally or medially (or both) and about as long as one flagellomere, flagellomeres ventrally covered with short cilia; longest pectinations slightly longer than 2× width of corresponding flagellomere, each flagellomere distally adorned with curved, thick seta slightly less than half length of longest pectination, median pectinations also adorned dorsally with shorter, curved seta located near middle on shorter pectinations and subapically on longer pectinations. Thorax: Patagia greyish brown flecked with beige; tegulae concolorous with patagia, with elongate and thin white scales apically; mesothorax concolorous with tegulae anteriorly, with more beige scales toward apex; metathorax with long, whitish beige scales. Legs with coxa and femur greyish brown abundantly speckled with beige; fore- and midleg with tibia and tarsomeres darker greyish brown with few beige scales laterally on tibia and at apex of each tarsomere; hindleg tibia and tarsomeres paler, with more beige scaling than on other two legs, but also with distinct paler rings at apex of each tarsomere. Forewing length: 12–15 mm (holotype 14 mm). Coloration greyish brown with or without apparent pattern of up to 4 darker greyish brown lines slanted toward outer margin, starting on inner margin postbasally, submedially, postmedially, and subapically, curving back at median sector, and connecting with costa; under magnification scales from light to dark beige and brown; fringe concolorous, with some longer scales white. Hindwing pale greyish brown, rarely with marginal 1/5 slightly darker; fringe slightly contrasting, paler,

mixed white to pale brown. Underside of wings mostly pale greyish brown; forewing with costa, apex, and outer margin speckled with white to pale beige.

Abdomen: greyish beige. Genitalia (n=8) (Fig. 11). Uncus rather narrow, moderately long, with sparse, short setation mostly laterally except toward apex, setae slightly longer on slightly swollen section from middle to before apex, with curved, sharply pointed, downturned apex. Cucullus with rather wide median section slightly produced dorsally, with somewhat wrinkled edge, slightly narrowing distally to rounded apex. Corema very broad, not reaching apex of cucullus, with long spatulated androconial scales on broad base, and short-stalked, bulbous ones on distal 2/3. Ampulla short, thumb-like, with mostly short setae, mostly on dorsal surface and apex. Phallus cylindrical, distal third with lateral walls partly unsclerotized, ventral and dorsal sclerotized areas adorned with scobination on distal half dorsally and distal ¼ ventrally, left lateral wall distally with narrow sclerotized and scobinated band ending in short spined crest; coecum penis with minimal ventral incline, not enlarged; vesica with row of about 6–10 sclerotized rounded bumps dorsally on left side before middle, with 0–3 small spine-like cornuti on right side at level of row of sclerotized bumps, with dorsodistal narrower extension moderately developed, curved back almost to apex of sclerotized phallus shaft.

FEMALE (n=36). Color and maculation as in male. Antenna with flagellomeres slightly biserrate, some with seta sticking out dorsally, ventrally with short cilia, with thick seta at distal end of each serration about ¼ longer than one flagellomere, also with one lateral seta on each serration about half as long as distal seta. Forewing length: 12–14 mm. Frenulum with 2 acanthae. Genitalia (n=7) (Fig. 14). Papillae anales short, rounded, rather well sclerotized, with short setation along apical margin and especially as thick cluster at base dorsally, with long setae sparsely distributed on most of surface. Apophyses moderately long and thin; posteriores 1/3 to 2/3 longer than anteriores, approximately reaching ostium in extension. Segment VIII narrow, sternum desclerotized medially. Apex of sternum VII forming pair of rather long, narrow and apically rounded posterior extensions separated by narrow U with anterior end often slightly wider; ventral margin of U normally scaled; with descaled, scobinated surface on dorsal side of lateral extensions. Antrum wide, about 1/2 as wide as tergum VIII, thickly sclerotized, scobinated. Ductus bursae with posterior section dorsoventrally compressed, rather short, slightly wider than antrum, thickly sclerotized, scobinated, posteriorly curved at right angle dorsally and then again anteriorly; anterior section slightly wider, less thickly sclerotized, without scobination, not forming twist. Appendix bursae sclerotized and ridged, dextrally curved, of medium length, with or without spinules at base, narrowing before connecting with ductus seminalis. Corpus bursae circular, not much wider than anterior section of ductus bursae, membranous, with pattern of small pentagons or hexagons, about 1/4 longer than ductus bursae; signa a pair of small, limpet-shaped, oval, short-spined, low internal projections.

Larva. (From Perry and de Vries, 2003). 18 mm long. Head dark brown with white patches. Thorax and abdomen pale buff, heavily overlain dorsally and laterally with greyish and brownish black, these markings merging to more or less continuous black on either side of a pale median stripe.

Biology. The moths of *U. connerorum* are nocturnal and specimens have been attracted to light from sea level to the pampa zone. The following biological observations were given under the name *U. galapagensis* (Wallengren). Hayes (1975) reported the food plants as *Tournefortia psilostachya* HBK. and *T. pubescens* Hooker *f.* (Boraginaceae), that moths were often seen flying at dusk around plants of *Scalesia affinis* Hooker *f.* (Asteraceae), and that they fly in all months of the year. Silberglied (1978) reported moths being attracted to ship lights and thus being transported from island to island. McMullen (1993) observed moths visiting flowers of *Cordia lutea* Lamarck and *Tournefortia rufo-sericea* Hooker *f.* Roque-Albelo et al. (2002) treated the chemical defense and lack of aposematism of this species. They reported that the larva feeds on three species of *Tournefortia*: *T. rufo-sericea*, *T. psilostachya*, and *T. pubescens*. The moths of both sexes contain pyrrolizidine alkaloids as *U. ornatrix* (L.), which, in contrast, is diurnal and aposematically coloured. Perry and de Vries (2003) added *Heliotropium curassavicum* L. (Boraginaceae) as a food plant for this species. They added that the larva is solitary and draws leaves together, fastening their edges, for concealment, and that larval specimens were collected from May to November. During field experiments in the Galapagos, Garrett et al. (2008) demonstrated that the moths of this species were unpalatable to an orb-weaving spider (*Eustela vegeta* (L. Koch) Simon, Araneidae), which released moths given to them off their webs, but lava lizards (*Microlophus pacificus* Steindachner) ate the moths presented to them, which suggest that the endemic group of Galapagos *Utetheisa* lost their aposematic colouration to avoid diurnal lizard predation, but retained their chemical defenses to avoid nocturnal spider predation.

Etymology. We are pleased to name this species in honour of William and Mindy Conner in recognition of their many contributions to the study of arctiid moths, including Galapagos *Utetheisa*.

Distribution. This species is endemic to the Galapagos archipelago, where it is the most widespread of all *Utetheisa* species. We have examined specimens from Baltra, Fernandina, Floreana, Genovesa, Isabela, Marchena, Pinta, San Cristóbal, Santa Cruz, Santa Fé, and Santiago.

Remarks. This species and *U. galapagensis* apparently are the most closely related of the Galapagos *Utetheisa* based on the morphology of the female and male genitalia. This is corroborated by the mitochondrial sequence data mentioned above.

In one dissected female there was a tiny caterpillar (preserved on slide MHNG ENTO 5770) at the end of the oviduct. It was not enclosed in an egg capsule as the latter disintegrated during KOH treatment of the abdomen.

***Utetheisa henrii* Roque-Albelo & B. Landry, sp. n.**
urn:lsid:zoobank.org:act:85B5B499-10E2-4526-A8E4-6130A90A7763
Figs 3, 6, 10, 13

Material examined: Holotype: ♂, 1- 'ECUADOR | GALÁPAGOS | San Cristóbal | pampa zone | 18.II.1989, M[ercury]V[apour]L[amp] | B. Landry' [printed black on

white card stock, with 'ECUADOR' sideways on left]; 2- 'HOLOTYPE | Utetheisa | henrii | Roque-Albelo & | B. Landry' [handwritten in black ink on red card stock]; 3- 'BL 1654 ♂' [handwritten in black ink on green paper]; 4- 'Database # | CNC LEP | 00041388' [printed in black on white card stock]. Deposited in the CNC.

Paratypes: 3 ♂, 2 ♀: – 1 ♀ (dissected, slide BL 1653), same data as holotype except date (15.II.1989) (CNC); 1 ♂, 'ECUADOR [sideways on left side] | GALAPAGOS | San Cristóbal, 4 | km SE P[uer]to Baquarizo [sic] | 20.II.1989, MVL | B. Landry' (MHNG); 1 ♂ (dissected, slide LR 177) 'ECU. GALAPAGOS. San Cristóbal | El Chino. (R. Criollo) | S 0° 54' 53.5" W 89° 27' 15.4" | 195msnm 2–3.XII.2002. L. Guamán | T. Luz. (Hortalizas Frutales)' (IC-CDRS); 1 ♀ 'ECU. GALAPAGOS. San Cristóbal | El Chino. (R. Criollo) | S 0° 54' 53.5" W 89° 27' 15.4" 195msnm | 2–3. XII.2002. L. Guamán | T. Luz. (Hortalizas Frutales)' (IC-CDRS); 1 ♂ (dissected, LR 179) 'ECU. GALAPAGOS. San Cristóbal | Goteras. (M. Davis [farm]) | S 0° 52' 17.1" W 89° 26' 18.8" 359msnm | 4–5.XII.2002. L. Guamán, J. Loaiza | T. Luz. (*Brachiaria* sp.)'. Deposited in CNC, IC-CDRS, and MHNG.

Diagnosis: Among the Galapagos endemic species of *Utetheisa*, *U. henrii* (Fig. 3) has a dull pattern similar to that of *U. connerorum* (Fig. 4) except that *U. henrii* has a wider and straighter median line and the apical 1/5 of the forewing is wholly darker brown. Also, the male flagellum of *U. henrii* has shorter and thicker pectinations (compare Figs 6 and 7), and in male genitalia (Fig. 10) the uncus is thicker and shorter, the median part of the cucullus is more strongly produced, the left side of the phallus subapically is without a spined, elongate, triangular projection, the vesica has a clear set of spines dorsally where *U. connerorum* (Fig. 11) has a series of circular, sclerotized knobs. *U. connerorum* also often has 1–3 additional spines dorsally at the level of the knobs on the right side (4 specimens examined, one without these spines, two with one spine), and the narrower, dorsodistal extension of the vesica is longer in *U. henrii*. In female genitalia the main difference lies in the shape of the apex of sternum VII which in *U. connerorum* (Fig. 14) is narrower and has the lateral extensions longer, apically rounded, with the gap between them forming a narrow U, and altogether supporting dorsally the lateral walls of the antrum. The signa, ductus bursae, and ventral extension connecting with the ductus seminalis in *U. henrii* (Fig. 13) are also more strongly developed.

Description: MALE (n=4) (Figs 3, 6, 10). Head: Smooth scaled, with thinner scales on frons converging medioventrally, with ocelli, scales mixed dark to light brown but white along margin of eye and base of antenna; frons slightly rounded, without frontal protuberances; eye as wide as 3/10 of width of whole head in frontal view. Labial palpus small, projected slightly forward and upward, brown with white scales on basal segment and base of second segment laterally. Antenna bipectinate (Fig. 6), light brown scaled dorsally, with white scales ventrally on scape and pedicel; some flagellomeres with one thin seta sticking out of scale cover and about as long as one flagellomere, flagellomeres ventrally covered with short cilia; longest pectinations slightly shorter than width of corresponding flagellomere; each pectination distally adorned with long, curved, thick seta 2× length of pectination, and shorter, thinner seta from base of pectination dorsally and reaching tip of pectination or beyond (absent of some lateral pectinations).

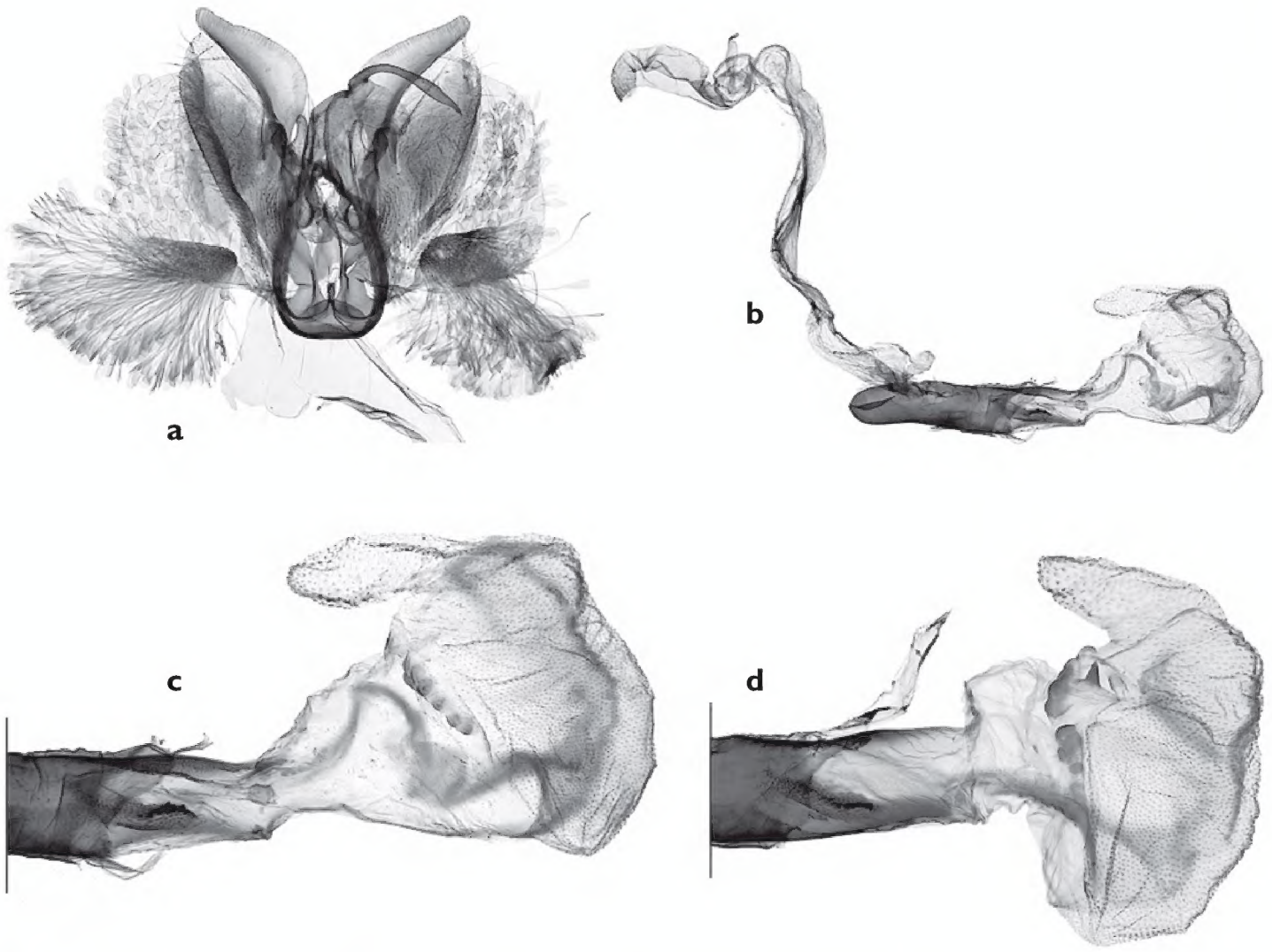


Figure 11. Male genitalia of *Utetheisa connerorum* sp. n., slide BL 1652. **a** Whole genitalia without phallus **b** Phallus **c** Enlarged vesica **d** Enlarged vesica from slide MHNG ENTO 5084.

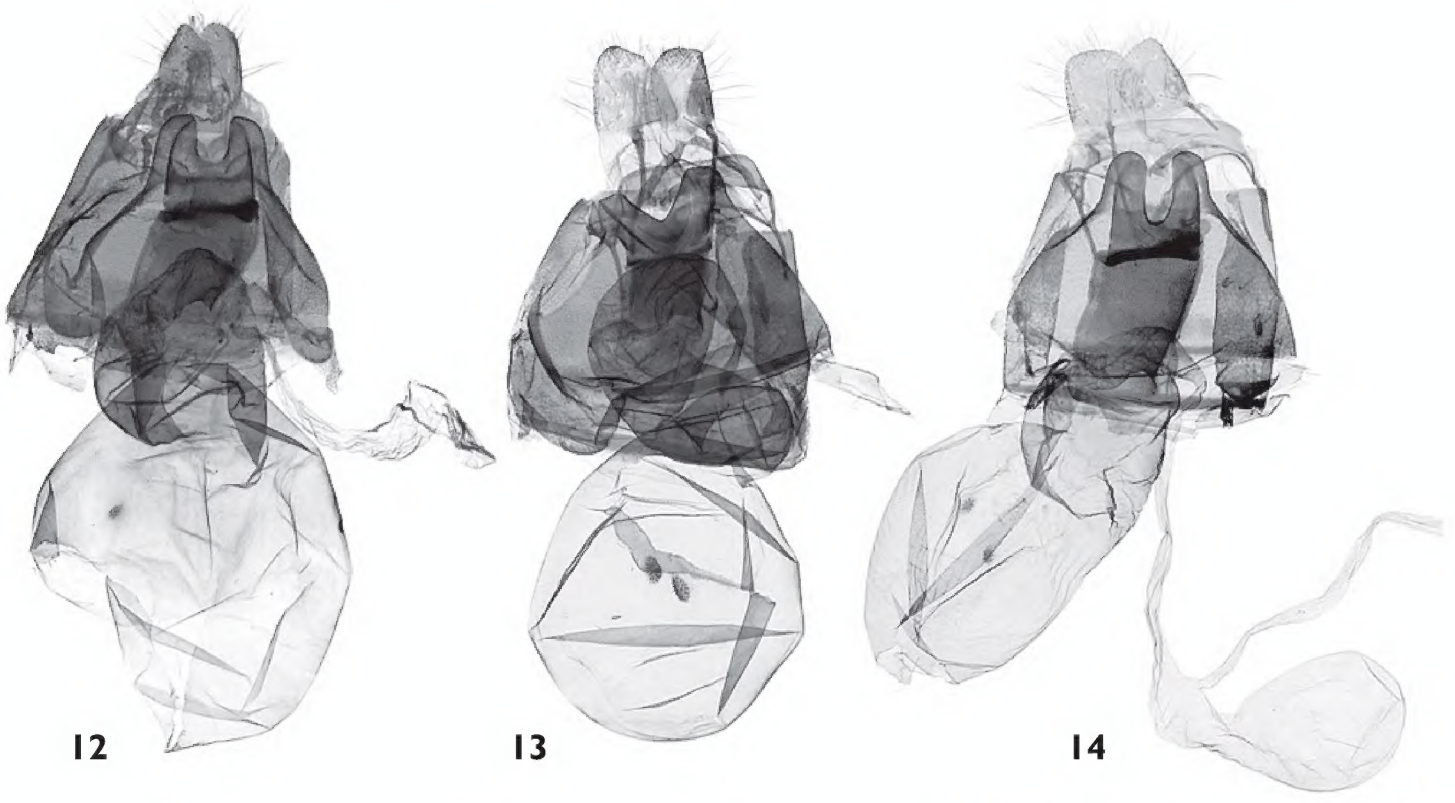
Thorax: Patagia brown flecked with beige; tegulae brown with hair-like whitish scales on edges and apex; mesothorax as collar; metathorax white-scaled. Legs mostly dark greyish brown on tibia and tarsi, flecked with pale beige especially on hindleg; coxae, trochanters, and femurs paler, white to beige, more or less flecked with brown. Forewing length: 14–16 mm (holotype: 16 mm). Coloration superficially brown with darker markings in faint postbasal, curved line, straight, well-marked, thick median fascia, faint, postmedian waved line, and well-marked, darker terminal 1/5; under magnification covered with mixture of light beige, dark brown, and brown scales. Hindwing light greyish brown; with diffuse brown marginal band slightly more apparent at apex of CuA2. Underside of wings less evidently marked than upperside and paler.

Abdomen*:* whitish brown. Genitalia (n=3) (Fig. 10). Uncus rather thick, moderately long, with short setae dorsally before distal 1/3 and ventrally before apex, swollen subapically, with curved, sharply pointed, downturned apex. Cucullus with median section broadly produced dorsally, with somewhat wrinkled edge, markedly narrowing into short, apical section with rounded apex. Corema broad, not reaching apex of cucullus, with long spatulated androconial scales on base of medium width and length, and short-stalked, bulbous ones on distal 2/3. Ampulla short, thumb-like, with mostly short setae, especially toward apex. Phallus cylindrical, distal third with lateral walls

unsclerotized, ventral and dorsal sclerotized areas adorned with scobination subapically; vesica with 5–8 small cornuti mediodorsally, dorsodistal narrower extension long, curved back almost to apex of sclerotized phallus shaft.

FEMALE (n=2) (Fig. 13). Color and maculation as in male. Antenna with flagellomeres slightly biserrate, some with seta sticking out dorsally, ventrally with short hyaline cilia, with thick seta at distal end of each serration about ¼ longer than one flagellomere, also with one lateral seta on each serration about half as long as distal seta. Forewing length: 16–17 mm. Frenulum with 2 acanthae. Genitalia (n=1) (Fig. 13). Papillae anales short, rounded, rather well sclerotized, with short setation along apical margin and especially as thick cluster at base dorsally, with long setae sparsely distributed on most of surface. Apophyses of moderate length and thickness; posteriores slightly more than 2× length of anteriores, approximately reaching edge of ostium in extension. Segment VIII narrow, sternum desclerotized medially. Apex of sternum VII forming pair of short, blunt posterior extensions separated by broad V; ventral margin of V with descaled, scobinated 'collar' anteriorly closed by narrow scaled rim. Antrum wide, 2/3 as wide as tergum VIII, thickly sclerotized, scobinated. Ductus bursae with posterior section dorsoventrally compressed, rather short, slightly wider than antrum, thickly sclerotized, scobinated, posteriorly curved at right angle dorsally and then again anteriorly; anterior section slightly wider, less thickly sclerotized, without scobination, forming one twist. Appendix bursae sclerotized and ridged, dextrally curved, of medium length, with few spinules on right side, narrowing before connecting with ductus seminalis. Corpus bursae circular, membranous with pattern of small hexagons, about 1/4 longer than ductus bursae; signa a pair of small, limpet-shaped, oval, short-spined, internal projections.

Biology. Unknown, found on the humid zone of San Cristobal. Host plants are probably members of the genus *Tournefortia* as in the other endemic species of *Utetheisa*.



Figures 12–14. Female genitalia of Galapagos *Utetheisa* species **12** *U. galapagensis* (Wallengren), holotype, slide BL 1655 **13** *U. henrii* sp. n., slide BL 1653 **14** *U. connerorum* sp. n., slide BL 1662.

Etymology. This species is named in honor of H.R.H. Grand-Duke Henri of Luxembourg for his most generous support to the Charles Darwin Foundation and the conservation of the Galapagos Islands.

Distribution. Presumed to be endemic. Currently known only from the Galapagos Island of San Cristóbal.

Acknowledgements

We are grateful to the authorities of the Galapagos National Park and those of the Charles Darwin Foundation for allowing fieldwork, logistical support during field work, and for permits to collect and export specimens. We also thank Novarino Castillo, Jose Loaiza, Stewart B. Peck, Patrick Schmitz, Bradley Sinclair, Eduardo Vilema, and Sarah Garrett for their help in the field and the latter also for rearing specimens. We are much grateful to Bert Gustafsson (NHRS), Jean-François Landry (CNC), Suzanne Rab-Green (AMNH), and Norman Penny and Bob Zuparko (CAS) for the loan of specimens under their care. Martin Honey, Natural History Museum London kindly provided bibliographic information. Michelle DaCosta, Department of Biology, Wake Forest University provided unpublished genetic data, reviewed the manuscript, and gave valuable critical comments. Florence Marteau and Philippe Wagneur (MHNG) respectively assembled the plates and provided the photos used here as Figs 1–4. And Ivan Löbl (MHNG) provided useful comments on nomenclatural issues. This is contribution 1090 of the Charles Darwin Foundation for the Galapagos Islands.

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